STAFFING LEVELS AND THE USE OF PHYSICAL RESTRAINTS IN NURSING HOMES: A MULTICENTER STUDY

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DISCLOSURES

None

KEY POINTS

- Despite the need for a minimum of manpower and education, patient characteristics (and not staffing characteristics) have shown to be crucial for restraint reduction.
- Physical restraints are especially applied in older nursing home residents with transfer difficulties and falls, increased bathing dependency and agitation.
- Residents with depressive symptoms are less likely to be restrained.

ABSTRACT

There is an unclear relation between staffing levels and the use of physical restraints in nursing homes. A survey design was used in 570 older persons (median age 86 years; 77.2% female), living on 23 wards within 7 nursing homes. Restraint use was high (one out of two residents, in 80% of whom on daily basis). Multivariate analysis was conducted at the level of the individual wards. Neither staff intensity nor staff mix was a determinant of restraint use. Bathing dependency (OR = 2.993, CI: 1.504–5.956), transfer difficulties (OR = 2.342, CI: 1.560-3.515), risk for falls (OR = 1.173, CI: 1.047-1.313), frequent restlessness/agitation (OR = 1.465, CI=1.045-2.055) and depression (odds ratio (OR) = 0.442, CI: 0.197–0.991), were independent predictors of restraint use. Patient characteristics have significant more impact on physical restraint use than staffing levels. Therefore, improving knowledge and skills of nursing home staff in better dealing with restlessness/agitation, mobility problems and risk for falls is encouraged to decrease the use of physical restraints in nursing home residents.

INTRODUCTION

The use of physical restraints in nursing homes (NHs) has often been questioned over the past decades, partly because its prevalence varies substantially (4-85%) (Gastmans & Milisen, 2006; Gulpers et al., 2013, Heinze, Dassen & Grittner, 2012; Kirkevold & Engedal, 2004, Köpke et al., 2012). Physical restraints are defined as "Any device, material or equipment attached to or near a person's body and which cannot be controlled or easily removed by the person and which deliberately prevents or is deliberately intended to prevent a person's free body movement to a position of choice and/or a person's normal access to their body" (Retsas, 1998, p. 186). This includes the use of belts, geriatric tables, bed rails, lean-back chairs, stable-doors etc. The main reason to use restraints is to prevent fall-related injuries or to control behavioral symptoms (e.g. agitation, wandering) (Evans & FitzGerald, 2002; Hamers & Huizing, 2005, Koczy et al., 2011). There is general agreement that its use should only be considered as the very last option after an extensive and individual evaluation of the resident since credible evidence of ineffectiveness and high adverse event rates has been published (Evans, Wood & Lambert, 2003; Möhler, Richter, Köpke & Meyer, 2012). Several resident characteristics, like incontinence, impaired mobility, cognitive and functional decline are associated with the use of physical restraints (Hamers, Gulpers & Strik, 2004; Heinze et al., 2012; Huizing, Hamers, De Jonge, Candel & Berger, 2007; Pekkarinen, Elovainio, Sinervo, Finne-Soveri & Noro, 2006).

Published data suggest that a combination of less qualified staff members (e.g. nursing aides (NAs) and licensed practical nurses (LPNs) and highly qualified staff members (e.g. registered nurses (RNs)) is required to provide acceptable quality of care (Castle, 2008; Weech-Maldonado, Meret-Hanke, Neff & Mor, 2004). However, in practice, many NHs have problems in recruiting RNs. This may have implications, since a number of studies have suggested that NH care teams with more RNs report less frequent physical restraint use, while NH care teams with more NA and/or more LPNs may be more likely to use physical restraint (Castle, 2000; Castle & Engberg, 2009; Wagner, McDonald, & Castle, 2013; Weech-Maldonado et al., 2004). Other studies, on the other hand, did not find an association between staff mix and restraint use (Huizing et al., 2007; Pekkarinen et al., 2006; Sullivan-Marx, Strumpf, Evans, Baumgarten & Maislin., 1999). It is also unclear how staff intensity (i.e. staff-to-resident ratios) correlates with restraint use. Previous studies have reported a positive (Huizing et al., 2007), a negative (Castle & Anderson, 2011) or no (Heinze et al., 2012; Karlsson, Bucht, Eriksson & Sandman, 2001; Sullivan-Marx et al., 1999) association between these variables.

Part of the interest of NHs in this matter is because of financial implications. Employing less qualified staff can result in substantial savings (Weech-Maldonado et al., 2004), at least for an equal quality of care, avoiding some of the typical costs associated with poor care (e.g. falls and pressure sores) (Ouslander et al., 2010).

To date, most studies on NH staffing have studied staffing at the institutional level (Castle, 2000; Castle & Engberg, 2009; Weech-Maldonado et al., 2004). Because staffing at the ward level is more relevant

(Castle, 2008), we examined the relation between ward staffing levels (e.g. staff intensity and staff mix) and the use of physical restraints in a NH setting.

MATERIALS AND METHODS

Design and sample

We invited all 20 NHs from the Flemish Navigator© network to participate in this survey. Navigator© is a quality indicator system assisting NHs in identifying opportunities to improve resident care (De Paepe, Breugelmans, Van de Water, Quaethoven & Vleugels, 2004). Participation within this study was voluntary and NHs were not obliged to participate with all wards. None of the invited NHs provided care exclusively for older adults with dementia or Alzheimer disease. Data collection was done from the 1st of November to the 31st of December 2011. After completion of the database all residents without missing data for the variables of interest (restraint use and nurse staffing levels) were included. Older persons, who became a resident of a participating ward or who were admitted to a hospital or died during the registration period, were excluded.

Variables

Activities of Daily Life (ADL)

The level of independency was assessed in every resident, using an adapted version of the Katz-index in which 6 items (bathing, dressing, transfer, toilet use, continence, feeding) are assessed with a 4-point Likert scale (1=independent, 2=mild dependent 3=partly dependent, 4=totally dependent). Two additional items (orientation in place and in time) were assessed with another 4-point Likert scale (1=no problem, 2=rare problem, 3= almost daily problem, 4=totally disoriented or impossible to evaluate) (Delesie, Sermeus & Vanden Boer, 1987).

Dementia/depression

A diagnosis of dementia and/or depression was registered based on the residents' medical record.

Falls

A fall was defined as "an unexpected event in which the individual comes to rest on the ground, floor or lower level" (Lamb, Jorstad-Stein, Hauer, Becker & Prevention of Falls Network Europe and Outcomes Consensus Group, 2005). The history of falls during the past 6 months was recorded for each resident. During both registration months, the number of falls was registered prospectively, and included all falls observed by nurses, but also unwitnessed events reported by participants, and participants found on the floor. Finally, fall risk was clinically estimated by the head nurses' with a visual analogue scale ranging from 0 (=no fall risk) to 10 (=very high fall risk) (Milisen et al., 2012).

Physical restraint use

Physical restraints were defined as mentioned in the introduction (Retsas, 1998). The use of bedrails on demand by a resident was not included in this definition. After every registration month, the frequency of restraint use (never/only 1 time/more than 1 time/daily) during the past month was registered.

Drug prescription

After every registration month, the average number of daily prescribed drugs per resident during that month was noted. Psychoactive drug (e.g. neuroleptics, antipsychotics/hypnotics, sedatives and anxiolytics) prescription (yes/no) was also extracted for the same time periods, since this is considered as chemical restraint (Meyer, Köpke, Haastert & Mühlhauser, 2009).

Restlessness/agitation

Frequency of restlessness/agitation was registered by using a likert type scale (e.g. never/seldom/often/always).

Ward staffing levels

According to Flemish legislation, standard staffing requirements per 30 residents are 5 FTE NAs and 5 FTE nurses (RN or LPN), of whom one is a head nurse. Staff mix was operationalized by registering the number of NA, LPN and RN per resident on a ward in terms of fulltime equivalents per resident (FTE/res). By adding up these ratios, a Total Full Time Equivalent per resident (TFTE/res) or staff intensity on a ward was calculated. Because very few (i.e. 1.5 of 330.7 registered FTE's) nurses had an academic degree, this category was added to the group of RNs.

Procedures

Falls were registered during two subsequent registration months by all care providers. All other variables were reported by the head nurse. Preceding the first fall registration month, demographics, ADL, dementia/depression, fall risk and fall history were registered. The use of physical restraints and drug prescription were noted after every fall registration month. Preceding the second fall registration month, restlessness/agitation was scored. After the fall registration period, a questionnaire on staffing details was completed. Informed patient consent was waived, since all study data were gathered by NH staff members

and anonymously delivered to the research team. The Committee of Ethics from the Faculty of Medicine, Leuven (Belgium) approved the study.

Analysis

Data were analyzed using SPSS version 17.0 (SPSS, Inc., Chicago, IL). Descriptive analyses (means, standard deviations, medians, interquartile ranges (IQRs), and frequencies) were calculated as appropriate. Differences between physical restrained and restraint free residents were tested by univariate analyses; e.g. chi-square test for dichotomous or nominal variables or Mann-Whitney U test for continuous variables with skewed distribution. Variables with P <.10 in univariate analysis were included in binary logistic regression. Generalized estimating equation (GEE) methods were used to test for any residual effect of clustering within units (Dykes et al., 2010). Backward elimination of the variable with the highest non-significant p-value was accomplished until all model predictors were significant (e.g. p < .05). Because there was a strong correlation between all staffing variables, separate regression models with identical resident characteristics were carried out for every staffing variable. If two variables showed a Spearman rho correlation of 0.7 or greater, the variable with the strongest restraint use association was selected to exclude multicollinearity.

RESULTS

Sample

Ten NHs agreed to participate within this study. Because of missing data on staffing and/or restraint use, the sample was reduced from 928 to 570 residents (61,4%). These residents had stayed on 23 wards to 7 NHs. Baseline characteristics between excluded and included residents, as mentioned in table 1, only differed for continence (median 3 (IQR = 1) vs. median 3 (IQR = 1); *P* =.023), fall risk (median 2 (IQR = 3) vs. median 5 (IQR = 6); *P* =.001), restlessness/agitation (median 1 (IQR = 1) vs. median 2 (IQR = 2); *P* =.003) and average number of daily prescribed drugs (median 8 (IQR = 5) vs. median 7 (IQR = 5); *P* =.005).

Prevalence of physical restraint and staffing

Physical restraints had been applied at least once to 271 (47.5%) residents during the registration period. Four out of every five residents were on restraints on a daily basis. The prevalence of restraint use on a ward varied widely, between 5% and 90%.

Staff intensity (TFTE/res) on a ward varied between 0.22 and 0.92 FTE/res. Staff mix on a ward varied as followed: 0.12-0.55 FTE NA/res, 0.04-0.23 FTE LPN/res and 0-0.19 FTE RN/res, respectively.

Risk factors for restraint use

Table 1 summarizes resident and staffing characteristics and indicates significant differences between restraint-free and restrained residents based on univariate analysis. Restrained residents were more care dependent than restraint-free individuals for all 8 ADL-items (P<.001), suffered more from restlessness/agitation (P<.001), and had more often been diagnosed with dementia (P<.001). Depressed residents were less frequently subjected to physical restraints (P<.05). Although the estimated risk for falls (median VAS score 6 (IQR=7) vs. median 3 (IQR=5); *P* <.001) was significantly different between residents with and without restraint application, fall incidence was not (4.5 falls per 1000 resident days vs. 5.7 falls per 1000 resident days; P>.05). In total, 178 falls or 5.1 falls per 1000 resident days were registered.

While there was no difference in staff intensity, staff mix variables showed that restrained residents were cared for by a caregiver team with significantly less NA (median 0.233 (IQR=0.051) vs. median 0.240 (IQR=0.078); P<.001), less LPN (median 0.081 (IQR=0.047) vs. median 0.083 (IQR=0.045); P<.05) and more RN (median 0.044 (IQR=0.052) vs. median 0.036 (IQR=0.038); P<.05).

Multivariable analysis

Because of multicollinearity, clothing (ρ= 0.93 with bathing), toilet use (ρ= 0.74 with transfer) and disorientation to place (ρ= 0.99 with disorientation to time) were removed from the multivariate analysis. Bathing, transfer, continence, feeding, time, dementia, depression, fall risk, restlessness/agitation and one staffing variable at a time were included in multivariate analysis. Backward elimination of the variable with the highest non-significant p-value simplified every regression model into an identical, which can be consulted in table 2. This model showed that bathing dependency (odds ratio (OR) = 2.993, 95% confidence interval (CI) =1.504–5.956, *P* =.002), transfer difficulties (OR = 2.342, 95% CI =1.560–3.515, *P* =.001), risk of falls (OR = 1.173, 95% CI =1.047–1.313, *P* =.006), and restlessness/agitation (OR = 1.465, 95% CI =1.045–2.055, *P* =.027) were significant predictors of restraint use. Being diagnosed with depression, on the other hand, reduced restraint risk (OR = 0.442, 95% CI =0.197-0.991, *P* =.047).

DISCUSSION

This survey compares staffing levels between restraint-free and restrained NH residents. Particular about our study was that we assessed staffing levels at the ward level, a more reliable approach than relying on institutional staffing levels (Castle, 2008).

Although this study focused on physical restraints, chemical restraints should be considered as well. Despite evidence that psychoactive drugs are only modestly effective and often lead to serious adverse events (Sink, Holden & Yaffe., 2005), the prescription of these drugs was common, in particular in restrained residents (e.g. 57.2% versus 52.8% for non-restrained residents). What this shows is that non-restrained residents are not necessarily given more psychoactive drugs. Of note, restrained residents suffered significantly more from restlessness/agitation, with physical restraints possibly contributing to their agitation (Evans et al., 2003).

In accordance to other studies as well, increased fall risk, transfer difficulties, increased bathing dependency and increased restlessness/agitation were found to be important predictors of restraint use (Hamers et al., 2004; Heinze et al., 2012; Huizing et al., 2007). Of note, incontinence was not associated with restraint use, while depression was related to lowered chances of being restrained. Restraint decision making is possibly influenced by a more passive behavior of depressed residents (e.g. depressive symptomatology such as reduced physical activity, apathy, lack of drive and fatigue). Although little research has been conducted to thoroughly examine this relation, Burton and colleagues (1992) also found this result in high restraint-use NHs. However, depressive symptoms in the same study were reported as a predictor in low restraint-use NHs, warranting further research. Although univariate analysis showed restrained persons suffering more from dementia in the current study, dementia was not an independent predictor for restraint use; and this is in contrast with earlier studies (Huizing et al., 2007; Sullivan-Marx et al., 1999). Precaution is warranted when interpreting this result because the use of medical record data for the diagnosis of dementia could have led to a misclassification bias.

Although univariate analysis showed significant differences in staff mix between restrained and non-restrained NH residents, neither staff intensity nor staff mix was an independent predictor for restraint use in the multivariate model. These findings go against the widespread assumption that more staff and, specifically, more RNs may be a prerequisite to limit restraint use (Castle, 2000; Castle & Anderson,

2011; Wagner et al., 2013; Weech-Maldonado et al., 2004) and that restraint use is an inevitable consequence of staffing shortages (Bourbonniere, Strumpf, Evans & Maislin, 2003). Although future studies in this area should include longitudinal staffing data and focus on specific staffing characteristics, such as years of clinical experience (Castle, 2008), it would seem that restraint application is more about resident characteristics and less about staffing, a result also found by Huizing et al. (2007). In this context, further research should focus on strategies to prevent and/or reduce restraint use in well-defined subsets of residents. More complex intervention studies are needed to achieve this goal, like a guideline- and theory-based multicomponent intervention tested in a randomized controlled trial (Köpke et al., 2012).

Approximately one out of two residents had been physically restrained at least once, most (80%) on a daily basis, which definitely is unacceptable given the numerous negative consequences of restraint use (e.g. pressure sores, depression, agitation, social isolation). As a consequence, nursing homes should urgently take measures to decrease the use of restraints. This study shows that patient characteristics (and not staffing characteristics) are crucial for restraint reduction and offers a risk profile for clinical practice. For instance, NH staff should be educated and supported to minimize restlessness and agitation and to tackle older residents' mobility problems. Since mobility problems are related to falls and increased fall risk was also related to increased restraint use in this study, more effort should be made by nursing homes to install multifactorial interventions to prevent falls (Cameron et al., 2012). Furthermore, tailoring successful interventions from recent restraint reduction studies to the own organization (such as promotion of institutional policy change towards restraint-free care, nursing home staff education, consultation by a nurse specialist, and availability of alternative interventions) (Gulpers, et al., 2011; Gulpers, et al., 2012; Gulpers et al., 2013; Koczy et al., 2011; Köpke et al., 2012; Möhler et al., 2012) can guide NH managers and administrators in better respecting residents' rights and ensuring the implementation of caregivers' core ethical values (Gastmans & Milisen, 2006).

This study has some limitations. The use of a convenience sampling, moderate missing data and a short registration period limit the generalizability of our results. Also, our results may be biased, since direct observation was not used to collect the data (allowing for underreporting of restraint use or falls and/or over-reporting of staffing levels). However, restraint prevalence in this study was in line with other studies, supporting the assumption that our data are reasonably reliable and valid. In addition, we did not take into account all possible determinants of restraint application (e.g. intensity of restlessness/agitation, severity of fall injury, improper behavior such as bothering other residents). Finally, as with all cross-sectional data, no formal causal relationships could be documented. Strengths of this study lie in data collection on ward-level and data analysis accounting for cluster effects.

CONCLUSION

We conclude that staffing levels may be less important determinants of restraint use than resident characteristics. Absence of depression, bathing dependency, transfer difficulties, risk for falls and frequent restlessness/agitation were independent predictors of restraint use. While restraint use was high, this study adds that improving the knowledge and skills of NH staff in better dealing with restlessness/agitation, risk for falls and mobility problems is recommended for reducing the use of physical restraints in nursing homes.

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Table 1. Univariate analysis of demographic, clinical and staffing variables for restrained and restraint free residents

Predictor	Missing Data	Total Population N= 570	Restraint Free Residents n=299	Restrained Residents n=271	Test Value	P-Value
Demographic factors						
Age, median (IQR)	28	86 (9)	86 (10)	87 (9)	$U = 34079.5^{\pm}$	.17
Age, n (%)	28				$\chi^2 = 1.54^{¥}$	.67
≤ 79		92 (17.0)	51 (17.6)	41 (16.2)		
80-84		126 (23.2)	71 (24.6)	55 (21.7)		
85-89		151 (27.9)	81 (28.0)	70 (27.7)		
≥90		173 (31.9)	86 (29.8)	87 (34.4)		
Sex, n (%)	8					
Male		128 (22.8)	71 (24.1)	57 (21.3)	$\chi^2 = 0.589^{¥}$	.44
Female		434 (77.2)	224 (75.9)	210 (78.7)		
Clinical variables						
Bathing, median (IQR)	69	4 (1)	3 (1)	4 (0)	$U = 17426.0^{\pm}$	.001*
Dressing, median (IQR)	69	4 (1)	3 (1)	4 (0)	$U = 17754.5^{\pm}$	.001*
Transfer, median (IQR)	69	3 (1)	2 (1)	3 (1)	$U = 14990.0^{\pm}$	.001*
Toilet use, median (IQR)	69	3 (2)	2 (2)	4 (1)	$U = 15320.5^{\pm}$	.001*
Continence, median (IQR)	69	3 (1)	2 (1)	3 (1)	$U = 17916.0^{\pm}$	.001*
Feeding, median (IQR)	69	2 (1)	2 (1)	2 (1)	$U = 19513.5^{\pm}$	.001*
Time, median (IQR)	69	3 (1)	3 (2)	3 (2)	$U = 23101.5^{\pm}$	.001*

Place, median (IQR)	69	3 (1)	3 (2)	3 (2)	$U = 23113.5^{\pm}$	.001*
Dementia, n (%)	1					
No		286 (50.3)	172 (57.5)	114 (42.2)	$\chi^2 = 13.290^{¥}$	.001*
Yes		283 (49.7)	127 (42.5)	156 (57.8)		
Depression, n (%)	1					
No		501 (88.0)	254 (84.9)	247 (91.5)	$\chi^2 = 5.752^{¥}$	.02*
Yes		68 (12.0)	45 (15.1)	23 (8.5)		
Average number of daily prescribed drugs, median (IQR)	26	7 (5)	7.5 (5)	7 (4.5)	$U = 36290.5^{\pm}$	.72
Psychoactive drug prescription, n (%)	0					
No		257 (45.1)	141 (47.2)	116 (42.8)	$\chi^2 = 1.088^{¥}$	.30
Yes		313 (54.9)	158 (52.8)	155 (57.2)		
Restlessness/agitation, median (IQR)	7	2 (2)	1 (1)	2 (1)	$\chi^2 = 30387.0^{¥}$	.001*
Fallen or not during past six months, n (%)	4					
No		371 (65.5)	197 (66.1)	174 (64.9)	$\chi^2 = 0.087^{¥}$	.77
Yes		195 (34.5)	101 (33.9)	94 (35.1)		
Risk for falls, median (IQR)	24	5 (6)	3 (5)	6 (7)	$U = 27013.0^{\pm}$	.001*
Fall, median (IQR)	0	0 (0)	0 (0)	0 (0)	$U = 39786.5^{\pm}$	.59
Fall incidence						
Fall Rate per 1000 resident days, n	0	5.1	5.7	4.5	$U = 0.001^{\pm}$	.32
Staffing variables						
TFTE/res, median (IQR)	0	0.366 (0.057)	0.361 (0.039)	0.366 (0.067)	$U = 38915.0^{\pm}$	.42
FTE NA/res, median (IQR)	0	0.238 (0.047)	0.240 (0.078)	0.233 (0.051)	$U = 32945.0^{\pm}$	.001*
FTE LPN/res, median (IQR)	0	0.083 (0.047)	0.083 (0.045)	0.081 (0.047)	$U = 36578.0^{\pm}$	.045*
FTE RN/res, median (IQR)	0	0.043 (0.049)	0.036 (0.038)	0.044 (0.052)	$U = 35864.0^{\pm}$	.018*

* Statistically significant (P<.05).

± Mann-Whitney U test for comparison of non-normally distributed continuous data.

¥ Chi-square (χ^2) test for comparison of dichotomous or nominal data.

IQR = Interquartile range; TFTE/ res=Total Full Time Equivalent per resident; FTE = Full time equivalent; NA/ res = Nursing Aides per resident; LPN/ res = Licensed Practical Nurses per resident; RN/ res = Registered Nurses per resident.

Table 2. Determinants of restraint use in NHs based on a binary logistic regression analysis

Variable	Estimate	SE	P-Value	Odds Ratio	95 % CI	
					Lower	Upper
Depression	-0,816	,4116	,047*	0.442	0.197	0.991
Bathing	1,096	,3511	,002*	2,993	1,504	5,956
Transfer	,851	,2073	,001*	2,342	1,560	3,515
Risk for falls	,159	,0577	,006*	1,173	1,047	1,313
Restlessness/agitation	,382	,1726	,027*	1,465	1,045	2,055

* Statistically significant (P<.05).